

REMARKS

In the office action, claim 14 is rejected under 35 U.S.C. §112, ¶1 with regard to language indicating that Bessel zone plates may be used to focus a beam, claims 11 and 12 are also rejected under §112, ¶1 on the grounds that there is insufficient disclosure in the application to support these claims, claims 1 and 2 are rejected under 35 U.S.C. §103(a) over U.S. Patent No. 5,900,637 (to Smith), in view of U.S. Patent No. 6,046,859 (to Raj), claims 3 - 6 are rejected under §103(a) over Smith and Raj in view of U.S. Patent No. 6,133,986 (to Johnson) and claims 7 and 8 are rejected under §103(a) over Smith, Raj and Johnson in view of the Kipp et al. article titled "Sharper Images by focusing soft x-rays with photon sieves" in Nature, vol.414, pages 184-188. Claims 9, 10 and 13 are indicated as being allowable if re-written in independent form.

With regard to the rejections under §112, ¶1, claim 11 and 12 state as follows:

11. A maskless lithography system comprising an array of diffractive elements, each of which focuses an energy beam into an array of images in order to create a permanent pattern on an adjacent substrate and has a focusing efficiency of at least 50%.

12. A maskless lithography system as claimed in claim 11, wherein said diffractive elements are 100% transmissive.

Claims 11 and 12.

The office action states that the disclosure is enabling for a maskless lithography system comprising an array of apodized diffractive elements that have a focusing efficiency of at least 50%, as well as for a maskless lithography system comprising an array of photon sieves that have a focusing efficiency of at least 50% and are 100% transmissive. The office action accepts, therefore, that the disclosure is enabling for at least one example of a system as claimed in each of claims 11 and 12. The office action

then states, however, that the disclosure is not commensurate in scope with claims 11 and 12 because all possible examples of the subject matter of claims 11 and 12 are not disclosed. Applicants' submit that §112, ¶1 includes no such requirement. Moreover, claim 13 is indicated as being allowable if re-written in independent form. Not only is the rejection under §112, ¶1 of claims 11 and 12 not consistent with the statements in the office action, but the rejection is also not consistent with the indication of allowability of claim 13, which depends from claim 12, which depends from claim 11. Applicants submit, therefore, that the rejection of claims 11 and 12 under §112, ¶1 should be withdrawn.

The office action states that claim 14 does not satisfy §112, ¶1 because a Bessel zone plate cannot focus an energy beam. Claim 14 as amended states that the system includes an array of Bessel zone plates, each of which converts an energy beam into an array of Bessel beams in order to create a permanent pattern on an adjacent substrate.

The Smith reference discloses a system for maskless lithography that employs an array of Fresnel zone plates that are illuminated by parallel beamlets of narrow-band electromagnetic radiation. The zone plates focus a significant fraction of the incident radiation to foci on a substrate and the beamlets may be individually turned on and off. The Smith references does not disclose the use of blazed diffractive elements as required by claim 1, the use of apodized diffractive elements as required by claim 3, the use of high efficiency ($\geq 50\%$) diffractive elements as required by claim 11, or the use of Bessel zone plates as required by claim 14.

The Raj reference discloses a segmented aperture lens that has multiple lens segments having predetermined patterns. Each lens segment may be a Fresnel lens, and

the lens segments are arranged in a two-dimensional array. The reference does disclose in Figure 2A and in column 2, lines 36 - 54 that each Fresnel zone plate in the array may be formed of a "blazed-type" pattern (col.2, line 47). There is no disclosure, however, of any teaching or suggestion in either Smith or Raj to combine the teachings of these references to arrive at the subject matter of claims 1 and 2.

The Johnson reference discloses a lithography system that uses a low resolution image projection system in which an aperture illumination field has a tapered profile over an aperture region. There is no disclosure of apodized diffractive elements as required by claim 3.

The Kipp reference discloses the use of photon sieves for focusing. There is no disclosure, however, of any teaching or suggestion in any of Smith, Raj, Johnson or Kipp to combine any of these references to arrive at the subject matter of claim 7.

Each of claims 2, 4 - 10, 11 and 12 depend from and further limit the subject matter of one of the above independent claims 1, 3 or 11. Each of claims 1 - 14 is, therefore, considered to be in condition for allowance. Favorable action consistent with the above is respectfully requested.

Applicants also request that the examiner review the references cited in the form PTO 1449 that was filed on June 2, 2004 with an Information Disclosure Statement that was filed on that date, and applicants request that the examiner initial the form PTO 1449 accordingly. If the examiner needs additional copies of any the references, please advise the undersigned representative.

Respectfully submitted,



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